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Agriculture Handbook No. 196

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FIG GROWING IN THE SOUTH

Growth Through Agricultural Progress

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FIG GROWING IN THE SOUTH

By A. H. Krezdorn and G. W. Adriance [1]

The fig *Ficus carica* L. is native to Caria, in Asia Minor. It belongs to the genus *Ficus,* a group of plants including trees, shrubs, and climbers, which have milky juice or latex.

Frequent references to the fig are made in the Bible, and it is also pictured in Egyptian hieroglyphics. It is adapted to the temperate regions and has been highly esteemed and widely cultivated for centuries in most countries in the Mediterranean area.

In the United States, the first figs apparently were brought to Parris Island, S.C., where they were reported growing in 1577. Two years later they were reported from Saint Augustine, Fla. In 1621 figs were introduced from the Bermudas to Virginia, and in 1629 they were reported flourishing there. Figs were introduced into Mexico in 1560, and from there into California and Texas.

BOTANY AND CLASSIFICATION

The fig fruit differs strikingly from most other fruits in several ways that relate distinctly to problems of production.

In most plants the fruit is the matured ovary of a single flower. The fig, however, is not a simple fruit; and opinion differs as to its true structure. Early investigators considered the fig a fleshy, enlarged receptacle bearing flowers on the interior surface. More recent evidence indicates that the enlarged, fleshy portion is actually a hollow peduncle, or fruit stem. It is known botanically as a syconium.

In any event, the main edible portion of the fig is not ovarian tissue; and so it is an accessory fruit. The minor portions are the remains of the flowers and small, gritty structures commonly called seeds. These so-called seeds are either the true fruits or the hardened walls of unfertilized ovaries that failed to develop.

Hormones, produced as a result of sexual fertilization following pollination, are necessary in order for most species of fruits to enlarge and mature. Some varieties of figs require sexual fertilization and some

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do not. The latter are called parthenocarpic varieties.

Figs are divided into four types based on the kinds of flowers and the need for pollination and fertilization. These are: The caprifig, the Smyrna, the common, and the San Pedro.

Caprifig.—The caprifig type is inedible. All other types are edible. The caprifig has male or staminate flowers as well as female flowers in the cavity of the fruit. The pollen is transferred from the caprifig to the edible fig by the fig wasp *Blastophaga psenes* L. The wasp hatches in the fruit of the caprifig, escapes through the eye of the fruit, and then enters the eye of the edible Smyrna-type fig in an attempt to lay eggs. In this way the pollen with which the wasp is covered is transferred to the female flowers.

Smyrna.—The Smyrna type bears only pistillate or female flowers and requires pollination to develop the small, dry, true fruits and the enclosed seed.

Common.—The third type, the common fig, develops its fruits parthenocarpically. Naturally, true seeds such as are found in the Smyrna type are not present in the common type. Varieties recommended for the South are in this group.

San Pedro.—The last important type of fig is the San Pedro. This type bears two crops, as do some varieties of the other types, one on the wood produced the previous year and the other in the axils of the leaves of the new growth. The first crop of the San Pedro type sets parthenocarpically, but the second crop requires pollen from the caprifig.

VARIETIES

Two general problems concerning varieties face fig growers—correct identification, and selection of the best variety for the area and for its intended use.

IDENTIFYING VARIETIES

A given fig variety is often sold under several different names. Sometimes a nursery offers a given variety for sale under two or more names. This has caused much confusion.

The Magnolia variety, as it is known throughout the South, was introduced as Madonna from England, where the name was later changed to Brunswick. It was named Magnolia in Texas when a tree peddler erroneously sold a large number of fig trees for ornamental Magnolia trees. In California, the Magnolia variety is correctly known as Brunswick, but the fruit has sometimes been erroneously marketed as Brown Turkey.

The true Brown Turkey is widely grown in the South under that name and was so introduced from England. However, in the past it has frequently been sold as Brunswick. In California, the San Piero variety is sometimes mistakenly listed as Brown Turkey. Sometimes the

San Piero is sold as California Brown Turkey and the true Brown Turkey as Eastern Brown Turkey.

Another confusing varietal name is the Everbearing, also known as Texas Everbearing, Ramsey, and Harrison. From the standpoint of fruit and tree characteristics, this variety is identical with Brown Turkey.

To avoid confusion, the varietal names most common to the South will be used in the text of this handbook. Some synonyms are included in the descriptions of the varieties.

Two factors make it difficult to describe and identify fig varieties. First, some varieties bear two crops: One, known as the breba crop, is borne on the leafless previous season's wood; the other, known as the second or main crop, is borne in the axils of the leaves of the current season's wood. Figs from these two crops vary strikingly. Second, the appearance of parthenocarpic varieties is changed considerably when they are caprified. Nevertheless, fig varieties are best identified by their fruit characteristics. Since the breba crop is of minor significance in the South and caprification is not practiced, descriptions will be based on main crop, uncaprified fruit.

The fruit shape may be spherical (round), turbinate (top-shaped), oblate (flattened on both ends), or pyriform (pear-shaped). It may also be lopsided or oblique.

The basal portion of the fruit is sometimes necked, and the stalk is sometimes a distinguishing feature because of its length.

An opening at the apex, which is lined with scales, is called the eye and leads to the fruit cavity. The eye varies in size. In some varieties it is large and open and in others small and closed by overlapping scales.

Flowers are borne on the cavity wall and, together with a portion of this wall, constitute the pulp. The pulp may vary from white to amber to some shade of red or pink, the last generally being described as strawberry colored. The remainder of the wall is called the meat, and it is usually white.

The undeveloped true fruits are contained in the pulp and are sometimes hard and gritty. They are commonly called seeds, and this term will be used in the

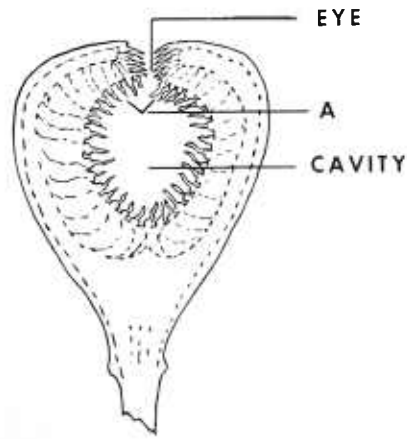

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FIGURE 1.—Diagrammatic longitudinal cross section of a common type fig fruit. Female flowers line the cavity, and scales line the eye. Caprifigs would have male flowers just below the eye at "A."

varietal descriptions even though no fertile seeds are contained.

The skin of the fruit may be green, yellow, bronze, violet, dark purple, or almost black. The surface is often ribbed or corrugated.

Because there are several distinct leaf shapes, much attention has been given to leaves as identifying features. However, no variety can be identified on the basis of leaf type alone. On a tree of a given variety, several leaf types will occur, although one type will predominate. Also, several varieties may have the same general leaf shape. Nevertheless, the leaf shape can be used to help verify an identification based on the fruit.

An early classification listed five leaf types: Okra, oak, maple, grape, and spoonbill. These names are rather descriptive and more useful to the grower than more precise taxonomic terms.

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FIGURE 2.—Variation in leaf type occurring on a single Celeste tree. Equal variation is common in other varieties.

SELECTING VARIETIES

For the South, susceptibility to souring and splitting, cold resistance, and ability to set large parthenocarpic crops are of paramount importance.

A number of varieties are excellent as fresh fruit and make good quality preserves. However, for commercial use, figs with the following characteristics are preferred: They should be medium-large, should peel easily and hold together well when cooked, should be relatively seedless, and should make a light-colored canned and preserved product.

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FIGURE 3.—The predominant leaf types occurring on the three fig varieties most commonly grown in the South. From left to right are Celeste (broad-lobed grape leaf), Magnolia (okra leaf), and Brown Turkey (grape leaf).

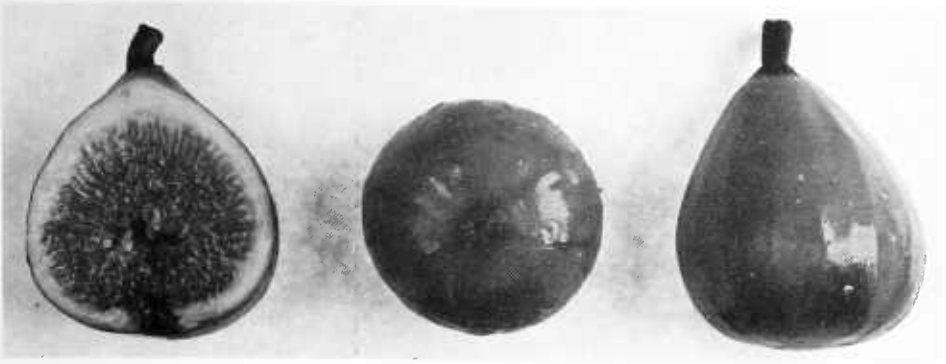

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FIGURE 4.—Fruits of the Brown Turkey (Everbearing) variety.

COMMON SOUTHERN VARIETIES

Brown Turkey (Lee's Perpetual, Eastern Brown Turkey, Brunswick, Ramsey, Harrison, Texas Everbearing, Everbearing).—Leaves 3- to 5-lobed of grape leaf type; fruit medium-sized, turbinate; usually without neck; eye medium open; skin bronze; pulp amber to pink; seeds few, soft; moderate vigor; small breba crop; large second crop matures from mid-July until late in the season; fresh fruit quality good; makes an excellent home preserve. Small commercial acreages are grown for local market.

Celeste (Celestial, Blue Celeste, Celeste Violette, Sugar, Small Brown, Malta).—Leaves 3- to 5-lobed, primarily with 3 broad lobes of the grape leaf type; fruit small, pear-shaped with tapering neck and slender stalk; eye closed; skin light brown to violet bronze; pulp strawberry pink; seeds small, hardly noticeable; fruit droops at maturity and is very resistant to souring and splitting; rarely produces bre-

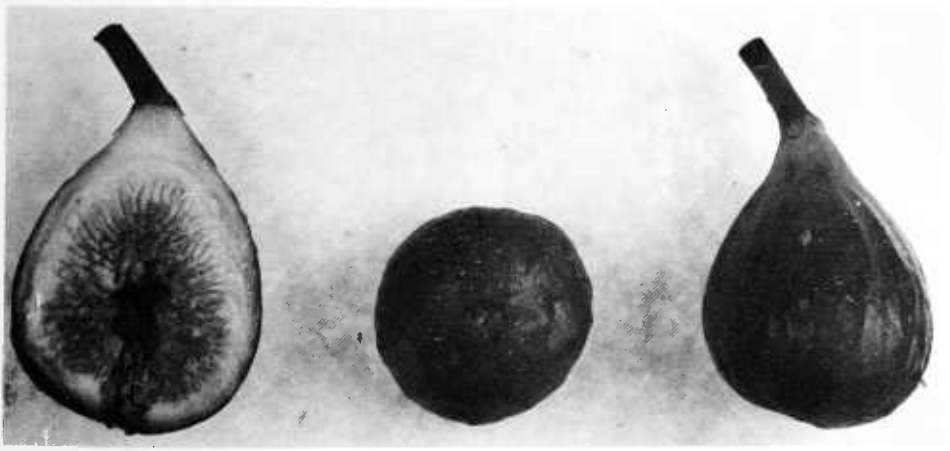

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FIGURE 5.—Fruits of the Celeste variety. Note closed eye.

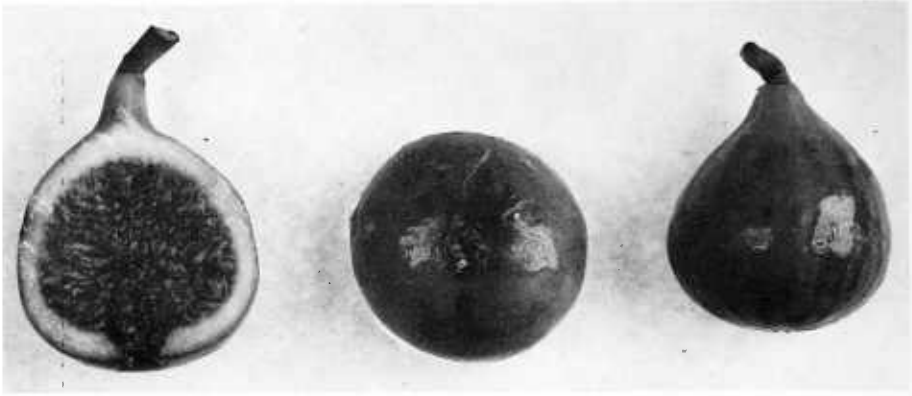

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FIGURE 6.—Fruits of the Green Ischia variety.

bas but has a very heavy main crop; ripens with Brown Turkey but has a shorter season; fresh quality exceptionally good; preserved quality excellent but dark colored; most widely grown dooryard variety in the South; a few preserved for the specialty market.

Everbearing.—Widely grown under this name but apparently the same as the Brown Turkey.

Green Ischia (Ischia Green, Ischia, Verte).—Leaves nonlobed to 5-lobed of maple leaf type; fruit medium-small, turbinate to pyriform; eye closed; skin bright green; pulp vivid strawberry red; seeds numerous and noticeable; like Celeste, droops at maturity and is resistant to souring and splitting; rarely produces brebas; main crop large and matures late, about August 1; fresh quality good; preserves dark and seeds somewhat objectionable; primarily used as a dooryard variety but some sold locally.

Hunt.—Leaves 3- to 5-lobed; fruit small to medium, pear-shaped; neck short; stalk long and slender, allowing the fruit to droop; skin dull bronze with white flecks and a distinct bloom; eye closed; pulp amber to pink; seeds few; very few brebas; fresh fruit quality good; somewhat similar to Celeste, but fruit is larger and yields are smaller; planted to some extent in Louisiana as a dooryard variety.

Kadota (Gentile, White Endich, Dottato).—Leaves nonlobed, 3-lobed, and 5-lobed but tending heavily toward 3-lobed and nonlobed, and larger than Celeste; fruit variable in size from small to medium-large, spherical to flattened on both ends; sometimes with short, thick neck; eye open but sealed with a drop of honeylike substance; skin rubbery and bright yellow in hot climate of Texas but green in cooler climates; pulp amber; seeds few; produces moderate breba crop and very large second crop; resistant to souring; fresh fruit quality fair to good; makes excellent canned and preserved product; not so common as other varieties in this group

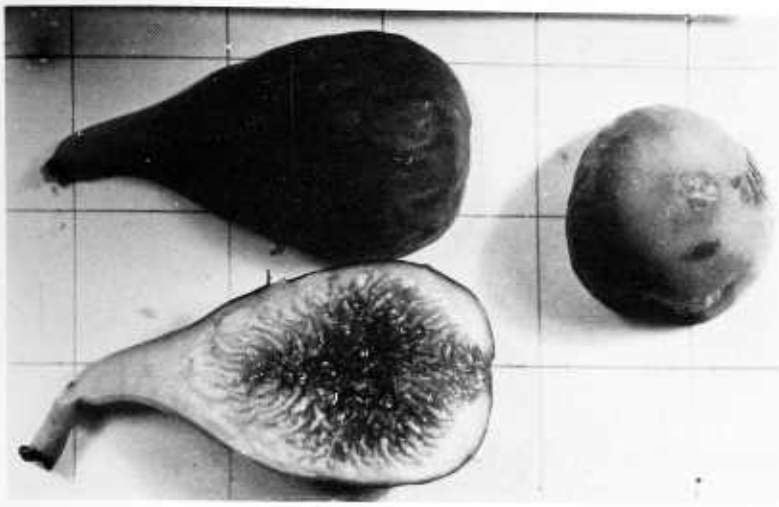

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FIGURE 7.—Fruit of the Hunt variety. Note the long fruit stalk and closed eye.

but should be more widely planted in the drier parts of the South. Kadota is the commercial canning fig of California.

Magnolia (Madonna, Dalmatia, Brunswick).—Okra-type leaves have characteristic long, fingerlike lobes that are most pronounced on sucker wood and heavily pruned trees; fruit medium-large, oblique-turbinate, lopsided; skin color bronze; neck absent; stalk thick and prominently swollen at fruit base; eye open; pulp light amber; seeds small, almost lacking; small breba crop; large second crop, ripening over a long season if pruned heavily; weak grower; does not droop when mature and splits and sours badly if left until full maturity; fresh fruit quality fair; excellent for canning and preserving. Magnolia is the commercial processing fig of Texas and is widely planted as a dooryard variety.

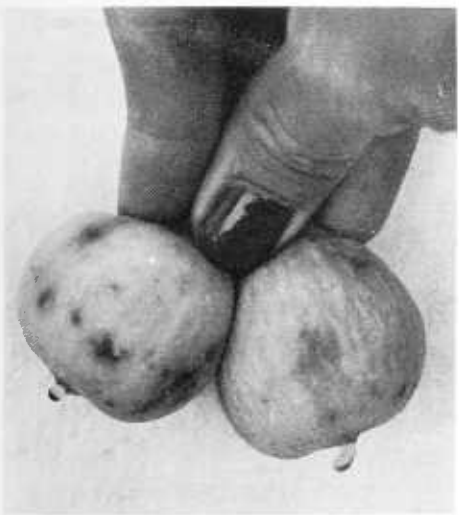

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FIGURE 8.—Fruit of the Kadota variety. Note drops of honeylike substance exuding from the eye.

MISCELLANEOUS VARIETIES

Lemon.—Medium-sized; greenish-yellow; eye open; white pulp; fairly conspicuous seeds; reportedly identical with Blanche, an old

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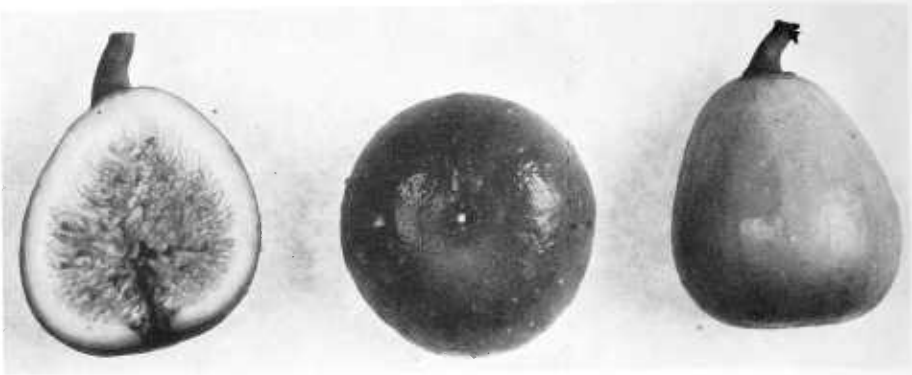

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FIGURE 9.—Fruits of the Magnolia (Brunswick) variety. Note open eye.

European variety sometimes known as White Marseilles in California. Lemon was once a leading variety in the South, but it is no longer propagated to any extent because of its mediocre quality and tendency to sour.

Thompson (San Piero, California Brown Turkey, Black San Pedro, Big Black).—Fruit very large with dark purplish-black skin fading to reddish-purple at the neck; large, open eye; pulp pink and undesirably coarse prior to full maturity; sours badly in wet areas; limbs tend to turn downward; yields moderate and quality only fair. Thompson was once quite common as a dooryard variety in Texas but is no longer widely propagated.

Mission (Franciscana).—Fruit medium-sized, pear-shaped, with or without a neck; eye usually closed; skin black; pulp amber to light pink; flavor good; susceptible to cold; production low. Mission is a leading variety in California both as a fresh fruit and as a dried product, but it is of little importance in the South today.

SOILS

Fig trees are adapted to an extremely wide range of soils. Satisfactory crops are produced on soils ranging from coarse sand to heavy clay, and on acid soils as well as those having an alkaline reaction; but fig trees are much more productive on deep, fertile loams and on well-drained alluvial soils than on infertile sands and poorly drained, shallow soils. Fig trees are moderately tolerant of saline conditions but may be seriously damaged by relatively small amounts of black alkali. They thrive on high lime or calcareous soils and are one of the few fruits that do not show severe lime chlorosis when grown on the blackland prairie soils of Texas.

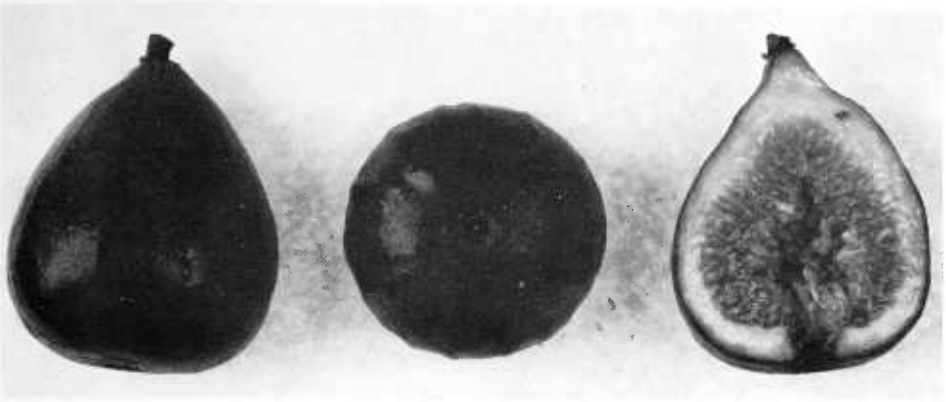

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FIGURE 10.—Fruits of the San Piero (California Brown Turkey) variety. California nurseries sometimes ship trees of this variety to southern growers for the true Brown Turkey.

Fig trees normally have extensive shallow-root systems, but they are able to develop deep roots where the soil permits. In Texas, on Lake Charles clay, roots of the Magnolia variety were found to have a 50-foot root spread, with roots penetrating as deep as 5 feet. An extensive system of feeder roots was found close to the surface. In California, fig roots have been found at a depth of 20 feet. These deep roots are very important, especially during a drought. Permeable, well-drained clay subsoils are preferred, as they retain moisture and permit deep rooting. Deep sands also permit deep rooting, but nematode damage in such sands is generally serious.

TEMPERATURE RELATIONS

The fig has characteristics of both tropical and temperate zone plants; however, low temperatures are generally more limiting than high ones.

GROWING SEASON TEMPERATURES

High summer temperatures favor vegetative growth. Optimum temperatures for fruiting and fruit quality are not so well defined. Satisfactory fruiting of some varieties occurs even in the cool San Francisco Bay area.

Figs mature rapidly in the Gulf Coast area during hot, humid days and warm nights. Under these same conditions, the Magnolia variety produces an excellent canning fruit. Maximum temperatures in this area commonly range from 85° to 100° F. and slightly above.

Consistent day temperatures much above 100° F. cause premature ripening and toughness. Excessively hot, dry periods result in a heavy fruit-drop of the Celeste variety, despite irrigation.

DORMANT SEASON TEMPERATURES

In the South, fig trees generally lose their leaves in the late fall and early winter and become dormant for several months. When fully dormant, they will withstand considerable cold. The ability to survive low temperatures depends on the variety, tree condition, type of wood, and degree of dormancy.

From the standpoint of actual wood damage, the Celeste variety is somewhat more hardy than are Brown Turkey, Magnolia, Kadota, and Green Ischia. Mission and Hunt are reportedly somewhat more susceptible to cold than are other common varieties. Mature trees of Celeste are rarely injured at 10° to 15° F. if fully dormant, and they have withstood temperatures close to 0°. Brown Turkey, Magnolia, and Kadota produce reasonably good crops on sucker wood; but Celeste, Green Ischia, Lemon, and Mission do not. Failure to produce on such wood is a decided varietal weakness where freeze damage is common.

Young trees and sucker wood of older trees are more susceptible to freeze damage than are old trees and the slower growing new wood of mature trees. The more succulent wood resulting from severe pruning is also more susceptible to cold than that of unpruned trees.

Plants prematurely defoliated by fig rust or drought are considerably more susceptible to freeze damage than others and may be damaged by temperatures no lower than 15° to 20° F.

Fig trees are extremely susceptible to low temperatures in the spring and fall. Spring frost damage to areas around the buds and to the cambial cells may occur without damage to the wood itself; however, leaves and fruit are undersized on such limbs and the limbs ultimately die.

PN-1048

FIGURE 11.—Limb on left was damaged by cold. Short, weak branches characteristically force out and may ultimately die. The vigorous shoot on the right arose from an undamaged limb.

METHODS OF PROTECTION FROM COLD

In commercial orchards little is done to protect fig trees against cold. Young trees are sometimes wrapped with corn stalks, but orchard heaters are not commonly used.

In cold climates several methods of protection are used by home gardeners and small growers. In England and the United States some figs are grown in greenhouses.

Some are grown in pots or tubs and stored in cool cellars during the winter. The Brown Turkey and Magnolia varieties are particularly suited to this practice.

In moderately cold climates figs can be trained against the southern exposure of walls as fan-shaped espaliers. They can also be grown in protected places as low bushes.

Another way to protect fig trees in cold areas is to prune the outward growing laterals in the fall, cut the top down, and tie the branches together. The trees should be wrapped with several layers of paper and with polyethylene film and the bases mounded with loose soil. This protective covering should be left on until the following spring.

A more elaborate procedure that is suitable only with well-drained, light-textured soil is to head the bush at 6 to 12 inches and to keep all but the low branches pruned off. In the late fall or early winter the limbs should be bent down, any remaining fruit or leaves removed, and the entire plant covered with soil. The soil should be removed in the spring.

ESTABLISHING THE ORCHARD

PROPAGATING

Fig trees are propagated in four ways: By cuttings, by air layers, by graftage (budding and grafting), and by seeds.

Cuttings should be made in the late winter from the previous season's growth. However, any wood up to 2 or 3 years old and not over ¾ inch in diameter can be used. Immature wood is pithy and slender and should not be used. Late-maturing wood at the terminals of the previous season's growth is sometimes damaged by low winter temperatures and should not be used for cuttings.

Cuttings 8 to 10 inches long are made with pruning shears. The basal cut should be made just below a joint or node. In well-drained soil, the cuttings are rooted directly in the nursery row or in the garden by planting them to such a depth

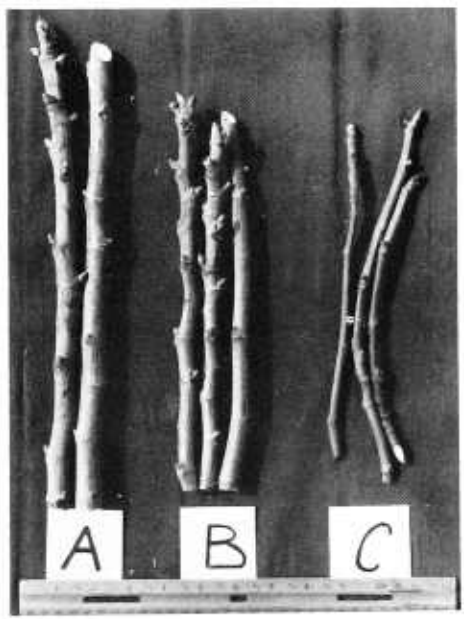

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FIGURE 12.—Fig cuttings "A" and "B" are from vigorous growth and will root well and grow fast. Cuttings "C" are from weak, spindly growth. They root poorly and grow slowly.

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that only the top bud remains aboveground. The soil should be kept moist but not excessively wet. Cuttings rooted in well-drained soil and given adequate moisture make tremendous growth. The Everbearing variety often produces a few figs the same summer it is rooted.

Home gardeners can root their cuttings in containers filled with well-drained and well-aerated soil. The cuttings should be planted so as to leave only the top bud aboveground. The basal end of the cutting should be slightly above the bottom of the container. Holes should be made in the container to assure proper drainage. The cuttings should be watered when they are placed in the container and again when they have leafed out. After that they may be watered like any other potted plant.

Figs can be propagated during the growing season by rooting leafy cuttings under mist or by air layerage. The use of these procedures, however, is seldom warranted.

To make an air layer, a ring of bark ¾ inch wide should be removed from a large twig or small branch. Moist sphagnum moss should be placed over the wounded area and covered with polyethylene film, and the film should be tied at both ends.

Fig trees can also be propagated by several methods of graftage, including the patch bud, the T-bud, and the bark graft. However, this type of propagation is seldom used.

Fig trees can be propagated by seed from those types that produce seed normally and from parthenocarpic types if properly pollinated. The resulting plants contain characteristics of both the male and the female parents. Propagation by seed is of value only to the plant breeder.

PN-1050

FIGURE 13.—Rooted cutting of fig. Note rooting at the joints or nodes and the vigorous shoot.

SPACING AND PLANTING

In commercial orchards figs are spaced anywhere from 10 by 10 to 20 by 20 feet. The more

common spacings range from 15 by 20 to 20 by 20 feet.

Where small acreages are grown in the more arid areas, the 20- by 20-foot spacings should be used unless irrigation is available. Even wider spacings are required on very rich alluvial soils, if the trees are not kept small by pruning.

For dooryard plantings, figs should not be set close to such plants as mulberry, chinaberry, hackberry, elm, black locust, and privet because these plants form very dense, widespread, shallow root systems which compete strongly for moisture and minerals. For best results, bushes should be planted where they receive full sunlight most of the day. Where fig trees or bushes are to be grown against the side of a building, a southern exposure is best.

Fig trees should be planted during the dormant season, and the time of planting depends to some extent on the severity of the winter. Early winter planting is advantageous in the South, because root growth is made during the mild winters; and a well-established root system can be developed prior to leafing out. Late winter planting is best in cold areas because this reduces the possibility of freeze damage.

PN-1051

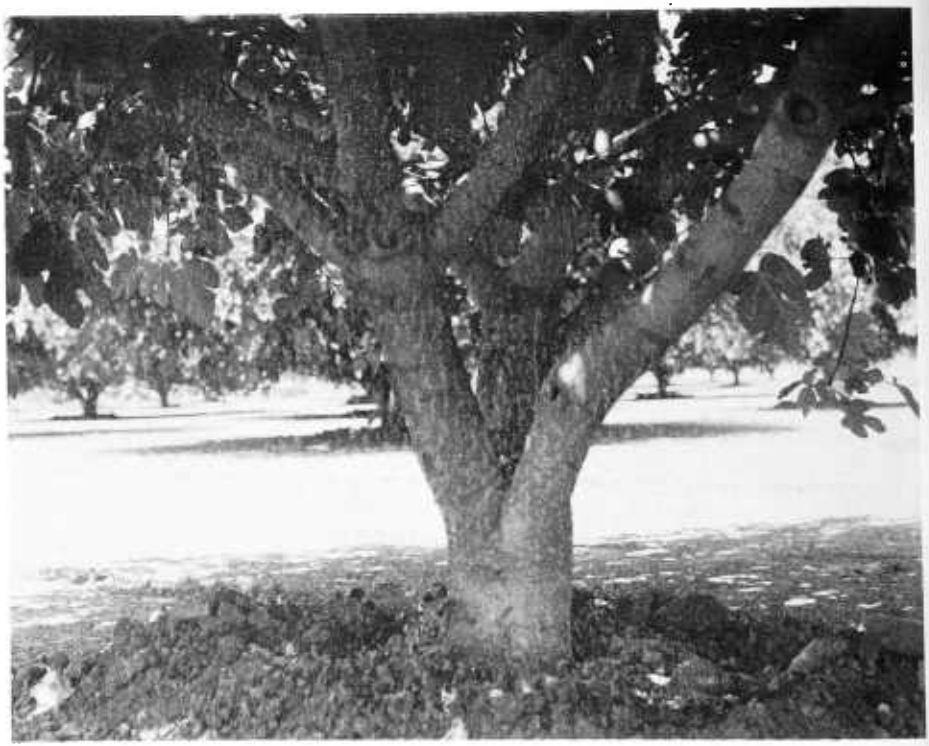
FIGURE 14.—Large fig tree growing next to the south side of a house. Protection from both nematode damage and cold is afforded.

Unlike most trees, figs should be set 3 or 4 inches deeper than they were grown in the nursery. This protects them against desiccation and cold. Fertilizers should not be added until 3 or 4 weeks after the plants have leafed out.

TRAINING TO TREE AND BUSH FORMS

Trees obtained from a nursery have usually been trained to a single leader. If a tree form is to be developed, about one-third of the leader is cut off when the tree is planted. During the growing season the basal sprouts are kept pruned off, and three to five scaffold or main branches are allowed to develop at a height compatible with cultivating and harvesting.

In the South nearly all figs are trained to the bush form or develop into bushes either because they are left unpruned or because they have been frozen to the ground. To obtain a well-formed bush, the young plant should be headed back to about half its height at the time of planting and allowed to grow one season. Sprouts grow out from the base of the main leader; and, during the winter following planting, three to eight vigorous, upright, widely spaced



PN-1052

FIGURE 15.—Fig trained to tree form. Frequent freeze damage in the South makes it difficult to maintain this form.

PN-1053

FIGURE 16.—Figs trained to the bush form. Bushes have been frozen to the ground several times.

sprouts should be selected as leaders. Special care should be taken not to select a sprout that tends to turn downward or grow parallel to the ground. It is extremely important that the leaders be spaced far enough apart to allow them to increase to 3 to 4 inches in diameter without crowding. If the leaders are crowded at the base, one or more may split off during high winds.

MANAGING THE ORCHARD

Fig trees are unlike other deciduous fruit trees in that the shoots continue to elongate so long as environmental conditions for growth are favorable. Moreover, fruit continues to set in the axils of the new leaves throughout the growing season. For this reason, conditions favorable for shoot elongation should, if possible, be maintained throughout the summer.

CULTIVATING

Fig orchards should be cultivated lightly because many feeder roots are near the surface, and they may

PN-1054

FIGURE 17.—Closely spaced leaders often result in splitting during stress of high winds.

be damaged if deep tillage is used. Light cultivation is necessary to break up surface crusts caused by heavy rains followed by intense sunlight. Weeds should be controlled to conserve moisture. If low branches are allowed to develop parallel to the ground, cultivation close to the base of the tree is difficult.

MULCHING

Mulches of hay, corn cobs, pine needles, sawdust, and other types of coarse organic matter have been used with figs; and the results have been excellent. Reports from Georgia and other parts of the South show an appreciable increase in size of fruit as well as an increase in yield and vegetative growth where mulches are used.

Mulching generally results in exceptionally good soil moisture, temperature, and aeration. Under a hay mulch, there is a leaching of available mineral elements from the slowly decomposing organic material. Mulching also helps overcome or prevent the ill effects of nematodes.

Since under a mulch some roots grow on the surface of the soil, the mulch should be at least 4 to 6 inches deep and should extend from the trunk to several feet beyond the extremities of the branches. However, good results are obtained even where the mulch is placed only under the branches.

Mulching is not used commercially to any extent because of its high cost and also because of the fire hazard. However, with door-

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FIGURE 18.—Commercial planting of Magnolia fig bushes. Note stocky leaders and long fruiting shoots.

yard plantings, mulching is highly recommended.

COVER CROPS

Use of cover crops helps prevent erosion by water and wind and helps improve water penetration. They should not be grown in commercial orchards during periods when soil moisture deficiencies are likely.

A cover crop that is susceptible to root knot nematodes should *never* be used as a cover crop in a fig orchard.

Consult your local county agent for recommendations as to the specific cover crop to use.

FERTILIZING

Little research has been done on the use of fertilizers for figs. However, there is certain basic information that is useful.

Fig trees characteristically produce good crops under rather low fertility levels. However, increased vigor and fruiting can often be achieved by use of fertilizers. This is particularly true where figs are grown on infertile, sandy soils and where they are grown in competition with lawn grasses and ornamental plants.

Fig trees habitually grow vigorously, and the leaves are large. Below-normal leaf size and terminal growth indicate the need for fertilizing.

Fig trees should be fertilized, in general, as are other fruit trees such as peaches and plums, except that fig trees rarely experience iron and zinc deficiencies.

Nitrogen is usually the only mineral in short supply. For large fig bushes, 1 to $1\frac{1}{2}$ pounds of nitrogen per tree per year applied in late

winter or early spring is generally adequate; but more frequent applications may be required in heavy rainfall areas. This amount can be increased or decreased as indicated by the size of the bush and the response obtained. In those areas where complete fertilizers are needed, a mixed fertilizer applied in an amount that will contain 1 to 1½ pounds of nitrogen should be used. The ratios of phosphorus and potassium to nitrogen should be about the same.

Where commercial acreages are concerned, consult your State experiment station for recommendations.

WATER REQUIREMENTS

For highest yields, figs need a large, continuous supply of water throughout the summer. This is more important for Magnolia and Brown Turkey varieties, which tend to bear continuously during the growing season, than for Celeste, which produces little fruit in late summer and early fall.

Rainfall is usually sufficient in the South to produce a reasonable crop, even when lack of water in late summer and fall results in discontinuance of shoot elongation and fruiting.

The commercial Magnolia orchards are located in areas where the average rainfall is high and little irrigation is used, although supplemental irrigation would frequently be beneficial.

The frequency and the amount of irrigation vary according to the soil. Soils that are shallow or less retentive of moisture need more frequent irrigation. Moisture is adequate if shoot elongation continues and leaf size is normal. In lawns, the grass beneath bushes or trees may wilt in the heat, while the rest of the lawn does not. This indicates the need for water. Some fig trees grown in lawn grasses need one or more waterings a week during the summer. Dooryard trees are sometimes overwatered, and this results in yellowing and dropping of leaves.

From the standpoint of survival, figs are surprisingly drought resistant. During severe droughts trees will shed their leaves before twig injury occurs and will go into a drought-induced dormancy. Subsequent rains often result in a late fall growth, and this growth is likely to be injured by cold weather.

PRUNING

The main reasons for pruning are to produce mechanically strong bushes, to open the bushes to sunlight and air movement, to facilitate spraying and harvesting, to lengthen the harvest season, and to make cultivation easier.

Care should be taken in pruning to cut back to a bud or lateral growing branch to avoid decay. Pruning differs somewhat with the variety; however, all suckers and low-growing lateral branches should be removed. The center should be thinned out to permit the entrance of sunlight and air. This helps to control leaf and fruit diseases and makes spraying easier.

From the standpoint of pruning, figs grown in the South fall loosely

into two categories: (1) Those that will not tolerate heavy annual pruning and (2) those that can be pruned heavily and still produce large crops.

The first group includes Celeste, Green Ischia, Mission, and Hunt. These varieties, with the exception of Hunt, branch freely and produce an abundance of laterals. Since breba crops are insignificant, vigorous, previous season's wood is not needed. If the branches are cut back heavily, the resulting vigorous sprouts are only lightly productive; and yield is severely reduced. For this group, only a general maintenance type pruning is needed. This includes heading the tree back occasionally to keep it in bounds, an annual thinning out of weak growth in the center, and removing dead wood.

The Hunt variety produces long, unbranched growth, which should be headed back to make it branch. The Celeste variety tends to produce a dense bush, and the inside growth should be thinned out.

The second group of varieties includes Magnolia, Brown Turkey, and Kadota. These varieties will produce good crops even if killed to the ground. Thus, they can be pruned severely and still produce well. The main crop is produced on new wood, but an appreciable breba crop will also be produced on the old wood. Thus, some vigorous previous season's wood is desirable. However, with the exception of Kadota, dooryard trees of these varieties are best handled similarly to those of the first group.

Kadota does not branch freely and often fruits excessively in relation to the available leaf surface. Heading back all vigorous growth from one-third to one-half of its length results in branching and a more favorable leaf-fruit ratio.

Commercially, Magnolia trees are pruned more heavily to facilitate harvesting and spraying than are dooryard trees. Also, the harvest season is lengthened because the vigorous shoots that result from heavy pruning continue to grow longer. A longer harvest period is important because nearly all of the crop is canned or made into preserves, and it cannot be processed economically in a short time. On the other hand, heavy pruning reduces total yield considerably, and a smaller portion of the crop is produced early in the season when prices are highest. In years past, Magnolia trees were pruned back annually to short stubs. Now, most growers head back the previous season's growth about one-third to one-half. This lengthens the season appreciably but does not reduce total yield so drastically as does more severe pruning. The bushes are kept low by frequently cutting back to upright growing laterals that arise from older wood closer to the ground. Vigorous suckers arising from below the ground level are used to replace old leaders that have become damaged.

CAUSES OF UNFRUITFULNESS

Fig trees generally produce large crops of fruit every year. When

they do fail to produce a crop, it is usually because of selection of unsuitable varieties, diseases, or unfavorable weather conditions.

Quite commonly, growers in the South mistakenly purchase varieties that require cross-pollination (caprification). Figs from such trees attain appreciable size but fall before maturity. These trees should be removed and a suitable variety of the common (parthenocarpic) type planted.

Fig rust causes the leaves to drop off; and the fruit withers and fails to mature, either because of sunburn or lack of food produced by the leaves.

In deep, sandy soils, nematodes reduce the vigor of the trees and fruiting is poor.

The tops of the trees are frequently frozen back. Some varieties fail to produce on the new sucker wood. Also, the wood is sometimes damaged but not killed. Fruit and leaves are formed, but the leaves are small and the fruit fails to mature.

During extremely hot periods, figs of the Celeste variety frequently shed a portion of their crop prior to maturity. This is true even when a plentiful supply of soil moisture is available.

Lack of soil moisture results in premature fruit-drop and a discontinuance of growth. Because figs are borne on the new wood, total yield is reduced if shoot growth is stopped.

FIG PESTS AND DISEASES

INSECTS AND MITES

The most serious insect pest of figs in the South is the dried-fruit beetle or sour bug, *Carpophilus* spp. These small, black beetles enter the fruit cavity through the eye, and the micro-organisms they carry produce souring and smut. Selecting varieties that have closed eyes at maturity or harvesting before the eyes open affords the best protection against these insects.

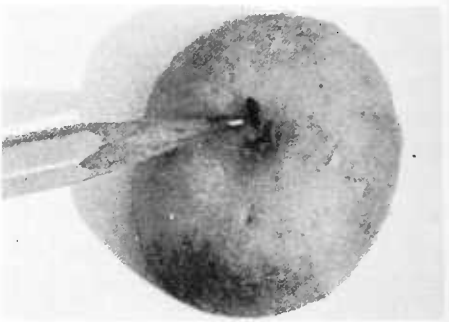

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FIGURE 19.—Dried-fruit beetle emerging from the eye of the fruit. This insect carries souring organisms.

Two other beetles sometimes cause damage. The fig beetle *Cotinis texana* Casey often causes severe damage in the western part of Texas. It is fairly large (0.75 to 1.3 inches long), is velvety-green, and feeds on fresh and damaged fruits. It also excretes a greasy substance that ruins the fruit.

The green June beetle or fig eater *Cotinis nitida* (L.) is found throughout the South but seldom

causes damage. It is similar to *C. texana* but is somewhat smaller and differs slightly in its markings.

These insects breed under piles of grass clippings, manure, and other organic trash. Removing these breeding places reduces the population substantially. Flooding the soil for 48 hours kills the eggs and some larvae of *C. texana*.

The citrus mealy-bug *Pseudococcus citri* (Risso) is found in areas where the winters are mild. It sucks juice from the fruit and secretes quantities of honeydew on which the sooty mold fungus grows. This fungus excludes light and hampers leaf function.

Mealy-bugs overwinter in leaf trash at the base of trees and in cracks in the bark. They can be controlled by cleaning up leaf trash and pruning and burning infested parts.

Scale insects, present sometimes in the Gulf Coast area, suck juices from the plants and cause some damage. Spraying with a 3-per-cent dormant oil during the winter controls them effectively. However, natural predators will usually control the scale before serious damage is done. Where a few small limbs of dooryard trees are infested, pruning and burning the infested parts are advisable.

The three-lined fig-tree borer *Neoptychodes Trilineatus* (L.) sometimes causes considerable damage in Texas and Louisiana. It has three scalloped white stripes that extend almost the full length of the adult beetle. Damage is caused by the grub, which bores into the tree limbs, feeds near the surface for several months, and then burrows deeply into the wood.

Borers usually attack only weak or damaged trees. They can be controlled by maintaining vigorous trees and bushes and by removing damaged branches.

The fig mite *Aceria ficus* (Cotte) is important as a vector for the fig mosaic virus. The status of this mite in the South is somewhat clouded. An early report indicated the mite to be in Florida, but the State Plant Board has never recorded its presence. In the South, numerous observations indicate that there is no spread of the disease in plantings where occasional mosaic-infected bushes are present. This indirectly indicates the lack of the fig mite in the South.

NEMATODES

The fig is extremely sensitive to root nematodes. The most common damage associated with these tiny worms is the root-knot or galls caused by *Meloidogyne* spp. Other nematodes attacking fig roots are *Pratylenchus coffeae* (Zimmermann) Goodey, *Trichodorus christiei* Allen, and *Xiphinema* spp. These nematodes result in various types of damage such as root lesions, stubby roots, and root rotting. Because of the root distortion and rotting, the important functions of water and mineral uptake and conduction and the storage of synthesized foods are reduced. This results in stunting and decline. The damage may also permit disease organisms to

enter the plant. In many areas of the South, nematode damage is so severe that commercial fig production is not economically feasible.

Sometimes figs are able to produce satisfactorily despite the nematodes. This is commonly due to clay subsoils. Nematodes are less prevalent in clay, and that portion of the roots growing in clay is damaged less.

Figs planted next to buildings generally grow exceptionally well. A partial explanation is that under buildings, where the vegetation has been eliminated for several years, the nematode population declines. Thus, the fig roots growing there are damaged less.

Where figs are planted in areas that are initially low in nematodes, the trees become established before the population builds up. This fact has led to spot soil fumigation with one of the nematocides.

Several compounds, chloropicrin (trichloronitromethane), EDB (ethylene dibromide), D-D (dichloropropene-dichloropropane), and Nemagon (1,2-dibromo-3-chloropropane), have given good results experimentally.[2] These materials should be injected into the soil as a liquid before young trees are planted. Nemagon is also available in granular form. Because of the relatively high cost of treatment, only a 10-foot strip that corresponds to the tree row is fumigated. For dooryard trees, an area 10 feet by 10 feet should be treated. The fumigants do not eliminate nematodes, but they reduce them to a point where the trees can grow well and send roots deeply into the soil before the nematode population again builds up.

Fumigation is not simple; and, where commercial acreages or highly valued dooryard plants are involved, an expert should be consulted.

One disadvantage of fumigants is their phytotoxic characteristics. Two weeks or more must elapse between time of treatment and time of planting when fumigants other than Nemagon are used. Planting can take place within a few days after treatment with Nemagon, but other treatments have given better preplanting control. Nemagon has also given good results when used on established plants.

Another material used on established plants is V–C 13 (0-2, 4-dichlorophynil 0, 0-diethyl phosphorothionate). The material is not a soil fumigant. It is emulsified in water and used as a soil drench. It is one of the safest for use on established plants and has been successful for use on lawns and numerous ornamentals.

Nematode-resistant rootstocks are available for many plants, but none of the varieties of edible fig have been found resistant. Some closely related species of the edible fig are nematode resistant, but none have proved satisfactory as a rootstock.

[2] Mention of specific products does not imply recommendation by the U.S. Department of Agriculture over others of a similar nature not mentioned.

OTHER PESTS

Bird damage from mockingbirds and grackles is sometimes serious, particularly with isolated fig trees. Where commercial acreages are involved, organized hunts by bird control associations help. There is no satisfactory control for dooryard trees.

Gophers and rabbits, while not causing widespread trouble, may cause serious damage in an individual orchard. Gophers can be controlled by trapping and poisoning. Commercial repellents give effective rabbit control when painted on tree trunks. Individual trees may be protected by wrapping the trunk with wire screen or by using a paper tree wrap.

DISEASES

Undoubtedly the most widespread fig disease in the South is fig rust, *Cerotelium fici* (Butl.) Arth., a disease caused by a fungus whose life cycle is not completely known. The fungus is believed to overwinter on the fallen leaves from which the uredospores are carried to the young, developing leaves in the spring. These spores germinate and cause small, yellowish-green spots on the leaves. The spots enlarge slightly and turn yellowish-brown, often with a reddish margin. On the underside of the spots, pustules are formed from which the fine, dustlike uredospores are again emitted. These uredospores result in additional infection of the new, tender leaves. Mature tissue is not infected.

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FIGURE 20.—Fig rust. Lesions are on the underside of the leaf, and sprays must cover this surface if the disease is to be controlled.

Infected leaves wither and turn brown. Severe defoliation often occurs, preventing proper fruit development and maturation. The fruit is undersized and tough or falls prior to maturity.

Fig rust has been controlled for many years by a 4–4–50 Bordeaux spray. The spray is applied when the first leaves have expanded to full size but have not yet hardened. Additional sprays are applied to the later developing leaves at intervals of 3 to 4 weeks. When rainfall is particularly heavy and frequent, spraying at closer intervals is necessary. It is very important to spray the undersides of the leaves as well as the tops and to cover the newly developing leaves.

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FIGURE 21.—Leaves at the base of the tree were covered with a Bordeaux spray in June and fig rust controlled. As shoots elongated, the new leaves were not sprayed and have fallen because of fig rust. Leaves at the tips of the shoots are infected but have not yet fallen.

So long as an appreciable amount of new foliage is developing and the weather is conducive to the spread of this disease, the sprays should be continued.

Fruit souring is a very serious problem brought on by bacteria and yeasts. It is often accompanied by "smut" caused by the fungus *Aspergillus niger* v. Tiegh., which discharges masses of black spores in the cavity of the fruit. Both souring and "smut" organisms are carried into the fruit primarily by the dried-fruit beetle, and controlling the insect controls the disease.

Fig trees are very susceptible to cotton root rot, *Phymatotrichum omnivorum* (Shear) Dug. In some areas of Texas cotton root rot is the limiting factor. The roots are destroyed and the tree or bush withers and dies in a short time. There is no resistant variety or rootstock and no known control.

Anthracnose, caused by *Glomerella cingulata* (Ston.) Spauld. & Schrenk, is a disease of the fruit and foliage that is sometimes serious. Often, the only damage is the formation of sunken, discolored areas on the fruit. At other times many of the fruits become shrunken and fall. The affected areas of the fruit are sunken and gray, often with pink spore masses in the center.

Cercospera leaf spot, caused by *Cercospera fici* Heald. & Wolf, sometimes appears in late summer. Irregular, reddish-brown spots form, followed by a yellowing of the leaf and leaf drop.

Several minor diseases found in the Gulf Coast area are closely associated with the extremely humid climatic conditions. Pink blight, produced by *Corticium salmonicolor* Berk. & Br., can be recognized by the dirty white to salmon-pink incrustations of fungal mycelia on the twig. Thread blight, caused by *Pellicularia kolerga* Cke., is evidenced by dark brown strands or rhizomorphs that extend along the stem. Matted foliage hanging from the twigs and attached only by the rhizomorphs is an identifying symptom. Another species of *Corticium, C. microsclerotia* Weber, attacks fig trees and causes a disease known as web blight. Brownish, dead, and dying areas of the leaf are covered with extremely fine strands of rhizomorphs that may give the leaves a silvery sheen.

The twigs and sometimes the fruits are covered with numerous small brown bodies called sclerotia.

In general, raking up and burning fallen leaves and fruit, pruning infected twigs, and avoiding excessively shaded and damp locations will largely eliminate the various leaf spots and twig blights. Where fig rust is controlled with Bordeaux sprays, other fungal leaf spots and blights are usually controlled also.

The only known virus disease of figs is fig mosaic. The leaf symptom is a mosaic pattern of light green areas that contrast sharply with the normal green of the leaf. Sometimes the leaves are malformed. Less pronounced light green spots may or may not appear on the fruits. All leaves do not show the pattern, and usually production is not noticeably affected. While this disease is widespread in California, only isolated cases have been found in the South. Recently, shipments of fig trees into Florida from the Mediterranean area have been destroyed because they carried the mosaic virus. Florida State Plant Board officials fear that some of the many species of ornamental figs grown in that State might become infected. Several ornamental species have been infected with the virus by budding them with buds from the infected edible type.

This disease is transmitted through infected cuttings and buds and by the fig mite *Aceria ficus* (Cotte).

HANDLING FRESH FRUIT

Ripe figs are extremely perishable and are difficult to ship and handle commercially in ordinary channels of distribution for fresh fruits. The larger varieties have been shipped and retailed in small, flat, wooden containers that hold only one layer of fruit. The percentage of loss in retail stores caused by soft rots of various kinds is high.

Small figs, particularly those of the Celeste type, have been handled satisfactorily in pint- and quart-sized berry cups. The Celeste stands up better than most varieties because it is firm and tends to dry out somewhat. For local use, it can be handled with good results when very ripe.

PROCESSING

Because fresh figs can be kept only a short time without spoiling, they are usually processed.

In the arid, irrigated fig areas of the world, a large portion of the crop is sun dried and marketed as whole dried fruits or as fig paste. The latter product is used largely in the bakery trade, which constitutes an important commercial outlet.

In the Southeastern States, figs are utilized largely as cooked preserves. Drying is not practicable

because of the high humidity and rainfall in this area. Some figs are also canned, frozen, and candied.

VARIETIES FOR PROCESSING

A good commercial canning variety should have moderately large fruit with few seeds. In addition, it should peel easily, remain whole when cooked, and make a clear, light-colored product. Magnolia and Kadota meet all these requirements and are the only varieties used to any extent for commercial canning and preserving, although some Celeste figs are preserved with the stems attached and sold as a specialty product. All fig varieties make good preserves for home use.

STAGE OF MATURITY

For canning or preserving, Magnolia figs are harvested while still firm; but they should not be so green and immature that the quality of the finished product will be inferior. As it approaches maturity, the fruit will change in color from a dull, dark green to a paler, somewhat mottled green. The fruit appears unripe to the inexperienced person, but it must be picked at this stage if it is to be firm enough to retain its shape in the cooking process.

For home preserving, figs are usually picked when fully ripe. They make very good preserves but do not remain whole.

PICKING

The fruit is harvested from the tree with the stem attached. Pickers wear cotton gloves to protect the fruit and to protect their hands from the irritating milky juice. Picking buckets of 2- to 3-gallon capacity are used. The fruit is transferred from the buckets to wooden field boxes and transported to the processing plant. To prevent crushing, rough handling should be avoided.

PEELING

In commercial practice, the fig fruit is peeled by the use of lye, and only the very thin skin of the fruit is removed. The fruit is placed in a vat of boiling lye water (1-percent solution) and allowed to remain about 1 minute; 30 to 40 seconds in a 2-percent solution is also satisfactory. Where a stronger solution, such as 5 percent, is used, the time interval is so short that it is hard to obtain uniform results; and for this reason the low concentration is preferred.

The maturity of the fruit influences the time required to peel it by use of lye. Generally, the riper the fig, the less time is required. It is good practice to test a few figs in the solution to determine the time needed for peeling.

Figs are usually peeled by hand when making home preserves because of the caustic nature of the lye solution.

Figs may also be peeled by dipping them in a boiling 2-percent sodium bicarbonate solution for 15 to 25 seconds, depending on the stage of maturity. The resulting product will be smooth and yet have a firmer texture than fruit peeled in lye.